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ВОПРОС ГРАММАТИКИ В ПОНИМАНИИ АКАДЕМИЧЕСКОГО ЧТЕНИЯ

THE GRAMMAR ISSUE IN ACADEMIC READING COMPREHENSION

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Аннотация: Изменение экономических условий и приоритетов в настоящее время влечет за собой и более научно-ориентированное высшее образование в России. Даже социальные и гуманитарные науки должны изучать больше научной литературы, написанной на английском языке, который является сегодня языком научной коммуникации. Основываясь на примерах, взятых из современных научных журналов и учебников, в статье фокусируется внимание на необходимости выделения того, как термины и грамматика, переплетаясь, могут естественно выражать сложные мысли и отвечать требованиям академических жанров на уровне текста. Выбранные примеры демонстрируют, как такое смешивание нередко приводит к проблемам в понимании существенного первоочередного условия для производства языка, что должны учитывать преподаватели в процессе обучения.

Ключевые слова: наука, язык, терминология, грамматика, понимание

Abstract: The present changing economic conditions and priorities are very likely to pose a more science-oriented higher education in Russia. Even the social sciences and humanities will have to consume more scientific literature written in English, the language of scholarly communication today. Based on examples taken from journals and textbooks, the article focuses on the need to highlight how terms and grammar mingle naturally to express complex thought and meet the requirements of academic genres at text level. The instances of language chosen demonstrate how such mingling quite often leads to problems in comprehension as an essential requirement prior to language production, an issue teachers should consider in the teaching learning process.

Key words: science, language, terminology, grammar, comprehension

In the aftermath of economic sanctions and Russia's decision to move away from an economy based on raw materials production, it would not be naïve to expect significantly larger government and private investment in science and technology R&D hitherto to boost the economy and with them a shift in higher education established paradigms. As far as the area of language and linguistics is concerned, the fact that "The world of contemporary science at the international level is pouring out more than 1.5 million research papers each year...and all of them are in English"[1] will very likely be the key factor leading to such paradigmatic change. In other words, we will have to teach more science in English in our classrooms for in today's world it is impossible to separate them.

Unfortunately, the task ahead seems to be quite challenging. The Education First English Proficiency Index (EF EPI) in 2013 ranked Russia in the 32nd place in the low proficiency group (51.08), slightly above only two EU countries, France and Italy. The same report acknowledged an upward trend (+5.29) as a result of several political and socio-economic events in only six years [2]. Last year's score was 50.44 (-0.64), the 36th place among 63 countries. The Urals' score was 46.54, a very low level [3]. By analogy, it is entirely appropriate to assume proficiency in academic English is much lower, though this is a world-wide education problem.

Such is the preoccupation with the learning of science in the educational world today that preceded by a tentative assessment on the need to redefine the understanding of literacy in the IT age, four years ago *Science*, a journal not devoted to educational research, run a series of articles on Science, Language and Literacy on the April 23 issue. In one of them, Schleicher, drawing attention to the huge amounts of information produced every day, suggests that the reproduction of knowledge acquired through reading skills is no longer enough. Success in the industrialized world requires reading to learn from unstructured, conflicting information on the Internet, for which it is essential to identify, understand, interpret, create and communicate knowledge "using written materials associated with varying situations in changing contexts" [4].

Achieving the above is further complicated by the fact that academic language is quite different from its everyday use. Its features, according to Snow, are "conciseness, achieved by avoiding redundancy; using a high density of information bearing words, ensuring precision of expression; and relying on grammatical processes to compress complex ideas into few words" [5]. Each pose a great challenge for comprehension, which together with its authoritative prose character may also affect the learner's decision on what to pay more attention to, criticize, or simply put aside, such as is the case of excluding theories, hypotheses

and conflicting research findings. However, Osborne points out, "... argument and debate, though common in science, are virtually absent from science education" [6].

Many teachers argue the language of science is complex, especially scientific terms, which is true. Specialist's terminology, however, is just the tip of the iceberg, the visible part. The grammar of science, on the other hand, is the quite often-neglected hidden part of the academic language iceberg in our classrooms. Below its surface, at text level, academic terminology is used in complex syntactic structures—embedding, grammatical metaphors, unambiguous reference and repetitions—in intricate patterns that make, even simple sentences, difficult to understand. A second issue, also related to comprehension, is ideology, which, in turn, has to be associated with critical reading, in the author's opinion, an essential skill today.

The goal of the present article is to argue, through academic text samples, how both grammar and vocabulary may hinder comprehension processes, as a *sine qua non* condition prior to language production.

Understanding academic prose comes first

Any teacher engaged in the teaching of academic language, no matter which, must keep in mind, first, that comprehension precedes but does not necessarily lead to production. These are closely related but entirely different psycholinguistic processes. Second, while exhibiting inter textual similarities, any sample of academic prose presents intra textual features that are always different. The former conform to the genre, as a social construction; the latter to the writer, as an individual communicator.

The problems in understanding scientific text construction derive from the ways into which the individual scientist is compelled to put into language complex thought (concepts, their relationship, processes) due to genre restrictions. In other words, on how he 'packs' new knowledge, which conversely, makes 'unpacking' for understanding difficult. According to Halliday, the SFL's father, "Knowledge is semiotic transformation: to know something is to have transformed it into meaning, and 'understanding' is the process of that transformation..." which is carried out by lexicogrammar. "Thus the lexicogrammatical system is a theory of human experience" [7:119].

The following section illustrates the statements above with examples taken from recent scientific journal issues and textbooks.

Polio's latest redoubts are "chronic excretors," people with compromised immune systems who, having swallowed weakened

polioviruses in an oral vaccine as children, generate and shed live viruses from their intestines and upper respiratory tracts for years [8].

The clause above has the following structure: Subj [NP] + Pred. [V1 + NP]. A key term in the clause above is *excreters*, which can only be understood if the student understands all the modifications that follow. First, that the noun in apposition is a definition of the term. This noun in apposition ends in a relative pronoun *who* which introduces a relative clause. However, a participial phrase has been embedded in the defining clause whose verbs *generate* and *shed* are too far from the subject to be comprehended at first reading. That is, clarity has been sacrificed for conciseness. Moreover, to understand the proposition above some knowledge from Virology may be useful for concepts such as *redoubts*, *excreter*, and *compromised immune system*.

The clause below is a garden-path sentence. Embedding ‘thus creating a mutually reinforcing experience’, the writer leads the reader to two possible interpretations. What are mutually reinforcing: ‘*professional identification and motivation? Academic success and feeling like a scientist? Or professional identification and motivation and academic success and feeling like a scientist?*

Moreover, both learning and professional identification increase confidence and, consequently, motivation, which in turn spur academic success and feeling like a scientist, thus creating mutually reinforcing experiences [9].

Sometimes what teachers believe a simple clause structure such as *X is Y* may turn so complex that even experienced academic readers may have trouble extracting meanings. In academic English when processes (actions) are nominalized they result in grammatical metaphors. In the clause below, both *X* and *Y* are grammatical metaphors. To understand the clause, it is essential to realize that *rHeA* is the instrument talked about in the previous sentence and that this is the acronym for the sentence subject. The first metaphor unpacked means that ‘the *rHeA* can replicate images with very high resolution of exoplanet (planets outside the solar system), but also record the seismologic activity of asteroids’. The second is that *rHeA* is simply a compact (Is it small? Is it solidly built? Is it economic in operation?) spectrograph which is fed by a fiber and operated in only one pattern of oscillation; would it be possible for any of the readers to tell me what *pattern of oscillation* is? Furthermore, what is an *exoplanet*? What is *calibration*? Will the reader guess that the compound *asteroseismology* implies the presence of earthquake and the like phenomena in asteroids?

One such instrument is currently being developed at Macquarie University, led by Dr Michael Ireland with PhD students Tobias Feger

and Carlos Bacigalupo. **The replicable High-resolution exoplanet and Asteroseismology (rHeA) spectrograph is a compact single-mode fibre-fed spectrograph** that uses novel approaches for careful calibration and temperature stability, which are key requirements for precise Doppler measurements [10].

Two of the most common reading comprehension problems have to do with reference and repetition (parallel and exact) as concepts in text grammar. If readers identify pro-forms and repetition correctly as well as their referents, information processing will be enhanced. The four clauses below, though somewhat packed with biochemistry terms, will not pose any challenge, provided backward referencing is identified properly. The reader has to identify that *this strategy* refers back to pharmaceutical *products which target only rate-limiting enzymes*. *Such intervention*, for the sake of style, is a parallel repetition of *products which target only rate-limiting enzymes* too. *Approach* in the fourth clause refers back to a new type of *intervention*, the idea the authors will convey in the rest of their paper. An important concept is that of *enzymes*: HMC-CoA reductase is only one of the many dozens of such substances, known and unknown, which have a role at the multiple levels of metabolism.

Metabolism is a complex phenomenon regulated on multiple levels. In current practice, pharmaceutical inhibitors are designed to target rate-limiting enzymes, such as HMG-CoA reductase (HMGCR), which controls cholesterol synthesis. However, this strategy fails to consider the redundancy of metabolic pathways and long-term effects of such intervention. A distinctly different approach is to target the underlying transcriptional regulation of metabolic pathways, controlling the activity of dozens of enzymes, both known and unknown, in order to program well-defined metabolic phenotypes [11].

A second example illustrating the difficulties posed by reference and repetition is given below. Observe that only the term ‘junction’, probably a kind of device in nanophysics and ‘QDs’ could impede comprehension. However, the reader/translator has to understand that ‘CB’ is an example of electron transport in semiconducting QDs; that the Kondo effect was only one among early predictions as a result of early studies in electron transport semiconducting QDs; and that these ‘early predictions’ were first tested in metallic nanoscale junctions.

Electron transport in semiconducting QDs has been studied since the early 1990s when phenomena like the Coulomb blockade (CB) was first observed (1). It soon became clear that QDs could allow to study the effect in transport properties of basic electronic correlations phenomena like the Kondo effect as suggested in early predictions (2,

3). These predictions were first tested in metallic nanoscale junctions containing magnetic impurities (4) [12].

A particularly extreme case of information embedding for the sake of compacting information is the one exemplified below. An *Is X like Y* base sentence, unarguably elementary level grammar, has been transformed into something very difficult to read.

Specifically, are they like structural descriptions (e.g., Marr, 1982; Minsky, 1975; Palmer, 1977; Pinker, 1984; Ullman, 1989), i.e., perspective-free representations of the spatial relations of parts of a scene that allow viewers to take different perspectives on them? Or are they like images (e.g., Kosslyn, 1980; Shepard & Podgorny, 1978), i.e., internalized perceptions, representing a scene from a particular viewpoint, namely, the one described in the text? The second set of studies investigates representation and access of particular spatial relations from particular perspectives [13].

Despite biochemistry terminology, the short paragraph below is well written and is not likely to pose any difficulties for understanding and translation, except for a few terms such as *GPCRs* and *drug targets*.

G-protein-coupled receptors (GPCRs) represent the largest class of membrane receptors. They transmit highly diverse signals across the cell membrane and form the most important class of drug targets. Over the last several years, GPCR structural biology has greatly expanded our knowledge on the recognition of agonists and antagonists of class A GPCRs, which form the bulk of this receptor group (Stevens et al., 2013). In contrast, class B GPCRs have only 15 members, all of which are medically important and are pursued as therapeutic targets [14].

The text below is well written; however, the field of discourse, political economy, implies ideology. Van Dijk highlights, “Whatever the differences may be between the many definitions of ideology throughout the history of the social sciences, they all have in common that they are about the ideas or beliefs of collectivities of people” [15]. In the following excerpt, ideology is expressed by ‘we’. Is ‘we’ inclusive or exclusive? That is, does ‘we’ refer to the authors or to both authors and readers with a defined social status? This last option seems what ‘we’ implicates. It must be assumed ‘we’ cannot refer to any potential reader, but to a definite readership, because it is hardly believable all human beings have a choice, the capacity to decide whether to enter in given modes of production and forms of exchange or not. Rather, most are constrained by the modes of production and are obliged to participate in certain forms of exchange as a matter of survival.

Ideology, as an aspect of interpretation, is quite often neglected in academic reading.

Whenever we engage in transactions involving the consumption or exchange of goods and services, we enter a chain of social relations stretched over time. Looking backward poses questions about the conditions of production and the social and environmental costs incurred, forcing considerations of justice and equity to the forefront of debate. Looking forward raises issues of waste, disposability; sustainability; and shared fate. These concerns are underpinned by fundamental questions about our responsibilities and obligations toward all those people who we will never meet but whose life chances and opportunities for self-realization are affected by the modes of production and forms of exchange we choose to enter into [16].

Conclusions

From the strategic point of view, it is absolutely necessary to equip our undergraduates with the knowledge and skills necessary to cope with academic language in professional settings as a result of the new economic reality and priorities. More work during the teaching learning process leading to excellence in self-preparation, not only in contents, but also on how to deliver them is the only way out to achieve such task. In this regard, ensuring comprehension of all types of scientific and technological genres before attempting any type of production is absolutely essential. This, to a great extent, means going beyond the inherent complexities of scientific and technological terminology to how they are used in grammatical structures. Students, in consequence, would be learning language through science and vice versa.

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